DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
MICROSYSTEMS TECHNOLOGY OFFICE (MTO)
PLANNED PROCUREMENTS
December 2001

PROGRAM DESCRIPTION	FUNDING	SCHEDULE	PROGRAM MGR
Advanced Lithography: This program will investigate innovative approaches that enable revolutionary advances in science, devices or systems. Specific research will focus on the following areas: (1) non-conventional patterning for emerging devices and structures (35 nanometers (nm) and below); (2) lithography for integrated circuits with features 50 nm and below; (3) lithography support technologies to reduce critical technical barriers and associated risks; and (4) device and lithography tool demonstrations in the fabrication of mixed technology microsystems or in the implementation of high-performance circuit functions.	$15M	BAA 01-36 Proposals due: 1/07/02 Total program: 3 years	Dr. David O. Patterson MTO
Vertically Interconnected Sensor Arrays (VISA): Develop and demonstrate vertically interconnected, focal plane array read-out technology enabling intelligent imaging arrays capable of: (1) more than 20 bits of dynamic range; (2) frame rates exceeding 10,000Hz; (3) integration of detectors and adaptive read-out in 3D unit cells at each pixel; and (4) pixel footprint areas limited only by optical diffraction. The extremely high dynamic range will be accomplished by novel multilayer read-out circuits. These circuits will enable imaging at more than 20 bits of dynamic range, whereas the current state of the art is over an order of magnitude lower. Adaptive read-out circuits will be vertically connected to individual detectors in either monochromatic or stacked multicolor 2D staring arrays. The ability to bring signal directly from the detectors to the read-outs (i.e., vertical interconnection) without first going through row-column multiplexers will allow for high frame rates concurrently with high-resolution images.	$35M	BAA 02-05 Proposals due: 01/22/02 Total program: 5 years	Dr. James Murphy MTO
Chip-scale Wavelength Division Multiplexing (CS-WDM): The objective of the CS-WDM program is to develop and demonstrate novel chip-scale WDM component level technologies for use in networks on-board current and future military platforms, and to develop and evaluate innovative concepts in network design. These new WDM components and network concepts should be capable of delivering significant improvements that are of particular benefit to military weapons systems, relative to conventional WDM methods. While each future application will have its own unique set of requirements, the list of potentially useful characteristics could include (but is not limited to) support for networks of up to 300 meters of single mode fiber, digital data channels of 2.5 Gb/s (scalable to 32 channels), high-speed dynamic reconfiguration, 0 to 70 degrees C temperature operation (minimum), multiple functions per chip-scale component or module (as dictated by a particular application), small footprint, low insertion loss, protocol and data format independence, fault tolerance, and the simultaneous transport of digital and analog data with performance metrics appropriate to the intended application. In addition, the list of performance specifications for analog link components could include (but is not limited to) instantaneous bandwidth at 20 GHz, spur free dynamic range from 130dB Hz to the power of (2/3)(goal > 140dB Hz to the power of (2/3)), NF < 4, and the RF insertion loss of 0dB. Components that will support low cost in manufacture and assembly are of particular importance.	$40M	BAA 01-48 Proposals due: 12/19/01 Total program: 4 years	Mr. William Schneider MTO

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Responsive Membrane Devices (REMEDE): The REMEDE program will develop and demonstrate chip-scale microsystems that mimic biological sensor functions while providing engineered feedback capability. These microsystems will incorporate ion gating proteins imbedded in bio-mimetic-based membranes using either bilayer lipid membranes and/or micromachined channels that mimic protein/membrane function, in particular allowing greatly enhanced design capability such as the integrated electronic readout of ionic currents, additional on-chip, non-biologically derived sensing processes and direct feedback. This high-risk approach will offer significant advantages over other bio-sensing platforms that rely on living cells or other carbon-based modalities to achieve cell-like behavior through the creation of two distinct fluid systems that communicate through engineered membranes. This communication provides the bio-sensing function, which then provides the bio-feedback capability. The realization of these bio-microsystems will enable a revolutionary semiconductor-based bio-microsystem (sense and actuate) that can mimic living cell-based sensing functions while providing in-situ specific feedback in response to signals. One thrust in this effort will be to determine the range of DoD applications for this revolutionary capability.	TBD	BAA XQFY0x Total program: 4 years	Dr. Michael Krihak MTO
Ultra Wideband Array Antennas: Array antenna radiating element technology will be developed to support instantaneous bandwidths ranging from 35:1 to greater than 100:1. Both receive only and transmit / receive structures will be explored. Planar structures, supporting conformal array fabrication on aircraft, and minimal stowage volume for spacecraft will be pursued. Additionally, high gain end fire structures will be explored for space flight applications where deployment complexity might be traded for significant reductions in both the number of radiators and associated beamforming hardware for equivalent radio frequency performance. One critical difference between this and other programs is that in this program the radiating structures are always analyzed in an array environment vice standalone. Excellent standalone wideband performance is not a good indication of arrayed behavior.	TBD	BAA TBD Total program: 4.5 years (Each of the 3 Phases is 1.5 years)	Mr. William Schneider MTO
Semiconductor Ultraviolet Optical Sources (SUVOS): The goal of this program is the development of semiconductor based ultraviolet (UV) light sources. Miniaturized UV light sources have application in biological agent detection, non-line-of-sight (NLOS) covert communications, water purification, equipment/personnel decontamination, and white light generation. It is the goal of the SUVOS program to exploit the unique characteristics of wide bandgap semiconductors to produce optical sources operating in the ultraviolet portion of the spectrum that can be integrated into modules and subsystems to address these applications. Of greatest interest are novel ideas that will result in the demonstration of deep UV (meaning wavelengths $\leq$ 280 nm) semiconductor optical sources. It is expected that most proposals will focus on exploiting the material qualities of the III-nitrides; however, there is interest in other wide bandgap materials (such as diamond), as well as organic materials. Other particularly novel approaches that do not involve the aforementioned materials will be considered if the end result is an extremely compact UV source compatible with the applications cited above.	$45M	BAA 02-03 Proposals due: 01/22/02 Total program: 4 years	LTC John Carrano, Ph.D. MTO

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Wide Bandgap Semiconductor (WBGS) Technology Initiative: This new initiative consists of two major thrust areas: (1) RF/Microwave/Millimeter-wave Technology and (2) High Power Conversion and Distribution Technology. Thrust 1: The objective of this thrust area is to enable new analog/RF, microwave and millimeter-wave frequency applications and capabilities through the development and exploitation of the material, device, and circuit properties of WBGS. Proposed efforts should concentrate on at least one of the following technical areas: (1) technology application and system concept studies; (2) development of large area (> 100 mm) semi-insulating silicon carbide (SiC) substrate technology; (3) development of large area (>100 mm), semi-insulating alternative substrate technology; (4) development of epitaxial material technologies; and (5) optimization of material technologies by correlating material advances with device performance. Proposed research should investigate innovative technical approaches that enable revolutionary advances in RF/microwave/millimeter-wave technology. Thrust 2: The objective of this thrust area is to enable high-power solid-state electronics to meet critical military needs for switching devices and integrated circuits that can meet the high-current, high-voltage, and speed requirements of electric components and sub-systems in emerging military applications. DARPA is mainly interested in power electronics technologies for mega-watt (1E6) scale applications. Such applications include efficient compact motor controllers and power distribution in future hybrid-electric combat vehicles, efficient high-power, high-frequency controllers and converters for naval ship propulsion, and applications in electric aircraft. A leading candidate semiconductor material for high power devices and circuits is SiC in the 4H polytype, but other wide-bandgap semiconductors will be considered as well for compelling power devices. The proposed research should concentrate on at least one of the following technical areas: (1) high-power semiconductor materials and processes; (2) high-power device structures; or (3) high-power integrated power circuit technology.	TBD	BAA 01-35 Proposals due: 12/31/01 Total program: 5 years	Dr. Edgar J. Martinez MTO Dr. John Zolper MTO